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The Digital Paradox: Why Does the Digitalisation of Industries in Western China Suppress China-Malaysia Trade?

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Abstract

This study investigates whether industrial digitalisation in western China promotes or paradoxically inhibits China-Malaysia bilateral trade, and examines the mediating role of government digital attention. Using panel data (2013-2023) from four western Chinese provinces (Chongqing, Guizhou, Guangxi and Yunnan), Partial Least Squares Structural Equation Modelling (PLS-SEM) is employed to test a moderated mediation model. Results reveal a significant "digital paradox": whilst digital industrialisation promotes trade, industrial digitalisation exerts a considerable negative effect on bilateral flows. Government digital attention positively moderates the innovation-to-digitalisation relationship, generating a net beneficial synergistic effect. The small sample size (41 observations) and provincial-level aggregation limit generalisability. Future research should extend to firm-level data and additional ASEAN partners. Policymakers should prioritise digital industrialisation over mere process digitisation, establish China-ASEAN digital trade pilot zones, and harmonise cross-border data governance to convert efficiency gains into trade expansion. This research offers theoretical perspective on digital trade friction by demonstrating that digitalisation can reduce trade when institutional coordination lags and regional competitiveness restructuring occurs.

Keywords: Industrial Digitalization, Digital Paradox, China-Malaysia Trade, Regional Competitiveness, Institutional Coordination

Introduction

The conventional wisdom that digitalisation facilitates global trade is increasingly viewed with scepticism in regional contexts. While digitalisation can lower trade costs, its benefits depend on local absorptive capacity. Without sufficient innovative capacity, digital investments may prove counterproductive, leading to "technological dependency" or "hollowing out" (L. Zhang et al., 2022; Li et al., 2023; Xu, 2023; Xu & Xu, 2023; Liang & Tan, 2024). Evidence from western China suggests the digital economy has done little to improve export quality, with some studies reporting negative impacts (Xu & Xu, 2023; Liang & Tan, 2024).

China's digital economy exhibits a distinct "high east, low west" divide (Luo & Zhou, 2022; Zheng, 2024; Shang et al., 2025; Wen, 2025). While the eastern region has leveraged its economic strengths and infrastructure to establish global digital trade leadership, western China possesses strategic significance as a hub for the New Western Land-Sea Corridor and Belt and Road Initiative, serving as China's gateway to Association of Southeast Asian Nations (ASEAN) despite weaker digital infrastructure. This context presents a natural experiment, particularly given the implementation of RCEP and strengthened China-Malaysia bilateral ties. Bilateral trade surpassed US$210 billion by 2024, with China consistently ranking Malaysia as its second-largest ASEAN trading partner (Malaysia External Trade Development Corporation, 2024; Xinhua, 2025). The Regional Comprehensive Economic Partnership (RCEP) framework theoretically offers unprecedented opportunities to integrate international trade with digital economic activity (Mishra & Valencia, 2023; Wang et al., 2024). Western China exemplifies both a digital depression and an open frontier to ASEAN. Yet the structural friction underlying regional economic integration remains poorly understood. This study addresses a fundamental question: does industrial digitalisation promote trade with Malaysia, or does it exert an inhibiting influence? This inquiry delineates the research issue of a prospective "digital paradox".

This paper addresses the limitations of broad national-level analyses by focusing on western China as a distinctive case study, examining China-Malaysia trade through a moderated mediation model combining development, regional, and institutional economics. The objective is to empirically identify the mechanisms and contextual parameters through which industrial digitalisation impacts trade, thereby enhancing theoretical comprehension of the "digital paradox" and providing policy recommendations to support high-quality development of the Western Land-Sea New Corridor.

Literature Review

The Relationship between Innovation and the Digital Economy

Innovation achievement transformation drives the digital economy forward through a circular mechanism. Digital industrialisation requires new technologies to create sectors such as online platforms and communications technology, which in turn generate novel business models (Banerjee et al., 2022; L. Zhang et al., 2022; Liang & Tan, 2024). Concurrently, industrial digitalisation depends on applying digital technologies to traditional industries to improve efficiency. When information technology merges with traditional sectors, it enhances management and customer service while raising industry-wide digital levels (Ma & Kang, 2025). Companies absorbing advanced technologies boost their innovative capacity and product sophistication (Jin & Pan, 2023). Consequently, regions with robust innovation

pipelines generally exhibit higher levels of both digital industrialisation and industrial digitalisation. The following hypotheses are proposed:

H1: Innovation investment has a significant positive impact on innovative achievement transformation.
H2a: Innovative achievement transformation has a significant positive impact on digital industrialisation.
H2b: Innovative achievement transformation has a significant positive impact on industrial digitisation.

Institutional Coordination and the Role of Government Intervention

New Institutional Economics (NIE) posits that economic cooperation requires institutional alignment among parties (Reátegui, 2013; Mirakhor & Askari, 2017; Mercuro & Medema, 2020; Arwani & Priyadi, 2024). In the digital realm, China and ASEAN countries maintain divergent regulations regarding privacy protection, cross-border data flows, and digital standards (Chen & Gao, 2022; Chin & Zhao, 2022; Su, 2024; Jiang, 2025). These institutional disparities constrain cross-border data flows, elevate compliance costs, and impede digital trade integration (Chen & Gao, 2022; Chin & Zhao, 2022; Su, 2024; Jiang, 2025). Slow institutional coordination undermines supply chain digitalisation and stifles digital economy innovation (Su, 2024; Jiang, 2025).

In this context, government digital attention and policy actions become critical. Strategic guidance and policy support can accelerate the commercialisation of innovations, whilst regulatory alignment with trade partners reduces institutional friction. The Chinese government, for instance, guides digital transformation through top-level design, policy support, and infrastructure programmes, whilst harmonising rules with trading partners (Jin & Pan, 2023; Wang et al., 2023; Yao & Wang, 2023; Wang et al., 2024).

Government intervention operates through digital economy planning, legal framework improvement, and cross-border dialogue promoting standard mutual recognition and regulatory cooperation (Meltzer, 2019; Chin & Zhao, 2022; Yao & Wang, 2023; Wang et al., 2024). Specific channels, including free trade pilot areas and digital economy cooperation frameworks, facilitate institutional liberalisation (Su, 2024; Wang et al., 2024; Ma et al., 2025). Effective institutions can mitigate the adverse effects of data restriction policies on digital financial services and trade (H. Zhang et al., 2025; Natanael, 2025), whilst enhancing online business conditions and digital sector competitiveness (Wang et al., 2024; L. Zhang et al., 2025; Ma et al., 2025). Governments must balance security, privacy, and openness through multilateral dialogue to prevent digital trade fragmentation (Meltzer, 2019; Chen & Gao, 2022; Chin & Zhao, 2022). Strategic governmental attention provides necessary infrastructure and institutional alignment to accelerate innovation absorption. Consequently, the following hypotheses are formulated:

H3a: Government digitalisation attention positively moderates the relationship between innovative achievement transformation and digital industrialisation.
H3b: Government digitalisation attention positively moderates the relationship between the transformation of innovative achievements and industrial digitisation.

Dual Dimensions of the Digital Economy: Digital Industrialisation and Industrial Digitisation

The digital economy comprises two dimensions: digital industrialisation and industrial digitalisation. Digital industrialisation occurs when digital technologies such as software and IT services create industrial clusters, directly boosting trade through exports of digital goods and services. It fosters new industries including ICT, cloud computing, big data, and AI, thereby accelerating technological upgrading and innovation (J. Zhang et al., 2022; Xu et al., 2022; Li & Zhao, 2023). Alongside digital governance and data value, digital industrialisation constitutes a core theoretical pillar of China's digital economy research framework (Xu et al., 2022).

Industrial digitalisation denotes the application of digital technology to traditional industries to enhance productivity and efficiency. Its trade effects are ambiguous: whilst smarter products may boost demand, improved production efficiency can substitute previously imported intermediate goods. Industrial digitalisation transforms agriculture, services, and manufacturing through smart manufacturing and the Internet of Things, encouraging new business models (Parida et al., 2019; Calderon-Monge & Ribeiro-Soriano, 2023; Li & Zhao, 2023; Matt et al., 2023; Wang & Wei, 2023; Javaid et al., 2024). This process improves industrial structure, supports green growth (L. Zhang et al., 2022; Ma et al., 2024), and stimulates technological innovation in manufacturing (Li & Zhao, 2023; Wang & Wei, 2023).

These dimensions are interdependent: digital industrialisation provides technologies for traditional sector transformation, whilst industrial digitalisation generates demand for advanced digital solutions (Xu et al., 2022; Li & Zhao, 2023). Together they drive industrial restructuring, value chain evolution, and high-quality economic growth (Li & Zhao, 2023; Ma et al., 2024), establishing a systematic framework for digital economy advancement (J. Zhang et al., 2022; Xu et al., 2022; Li & Zhao, 2023). Hence, the following hypothesis is proposed:

H4a: Digital industrialisation has a significant positive impact on China-Malaysia foreign trade.
H4b: Industrial digitisation has a significant positive impact on China-Malaysia foreign trade.

Reconstructing Regional Competitiveness and the "Digital Paradox"

Porter's theory of regional competition posits that advantage derives from a region's position in global value chains (Porter, 1990; Abbasi & Haryana., 2017; Tukirin, 2023). However, Chinese economic growth exhibits significant spatial disparities, with eastern regions outperforming the west in resource performance, industrial structure, and economic level (Jiang & Ye, 2017). Consequently, western China remains relatively uncompetitive. Industrial digitalisation in this region manifests through production automation and supply chain intelligence, yet slower development in digital infrastructure, technology adoption, and talent pools means digitalisation benefits are only partially realised (Jiang & Ye, 2017; TU et al., 2023).

Improved local production efficiency produces two consequences. First, digitalisation enhances automation, reducing demand for external inputs such as Malaysian intermediate products (TU et al., 2023). Second, upgraded western Chinese manufactured goods may compete directly with Malaysian exports. Simultaneously, western firms face technological, data security, and standardisation challenges that increase trade costs and reduce export

competitiveness. The widening digital gap between western and eastern China further hinders cooperative innovation and high-value exports (TU et al., 2023).

Thus, industrial digitalisation may transform competitive dynamics from complementary to a complex mix of competition and cooperation, potentially harming bilateral trade. The dual effect of reducing import dependence whilst constraining exports complicates China-Malaysia trade relations, necessitating closer examination of industrial digitalisation's true impact.

Conceptual Model and Research Hypotheses

Drawing on previous theoretical explorations of innovation, digital economic development, government digitalisation efforts, and China-Malaysia trade, this paper formulates a comprehensive conceptual model. This model integrates the innovation value chain, digital economy development, China-Malaysia trade, and the moderating mechanism of government intervention. Its purpose is to systematically reveal the transmission mechanism linking "innovation-digital economy-China-Malaysia trade" within the context of trade cooperation between western China and Malaysia. A key focus is placed on the moderating role of the government digital attention. Therefore, the following mediating hypotheses are proposed:

H5a: Digital industrialisation mediates the relationship between innovative achievement transformation and China-Malaysia foreign trade.
H5b: Industrial digitisation mediates the relationship between innovative achievement transformation and China-Malaysia foreign trade.

Together, these hypotheses form a cohesive theoretical framework. The conceptual model put forward by this paper is as follows (Figure 1):

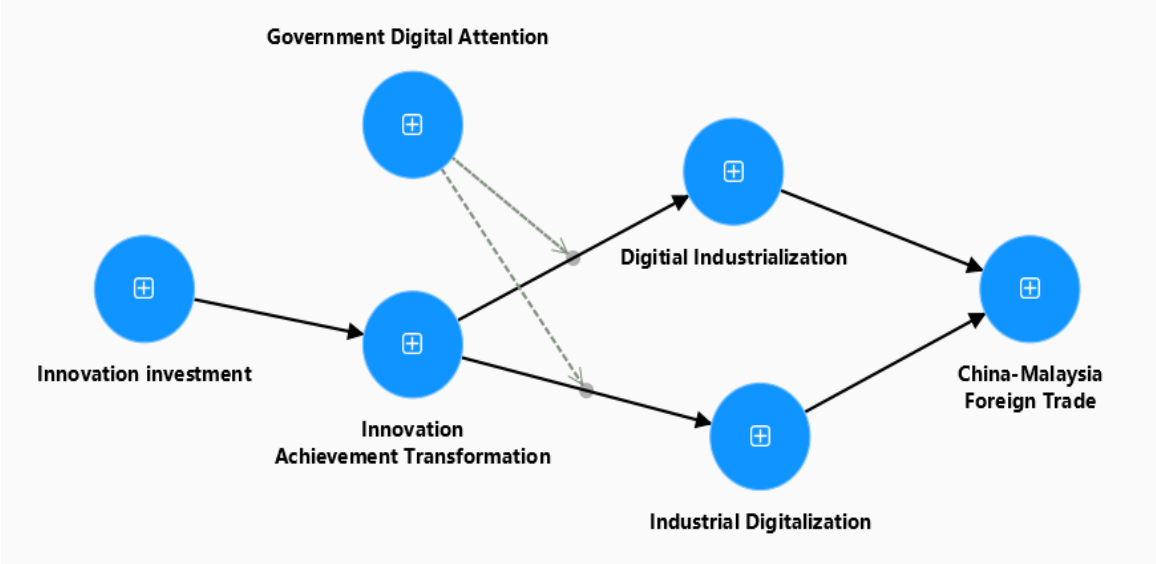

Figure 1 A model of the impact of innovation and government digital attention on the digital economy and China-Malaysia trade

Method

Data Source and Variable Setting

This study uses panel data from four western Chinese provinces (Chongqing, Guizhou, Guangxi, and Yunnan) for 2013-2023, sourced from the China Statistical Yearbook on Science

and Technology, the China Statistical Yearbook, and the China Customs database. Government digital attention is measured through word frequency analysis of digital economy terms in provincial government work reports (Wang et al., 2023; Zhang et al., 2024). This period captures the rapid growth of digital policies in both nations, including China's Digital China strategy and Malaysia's MyDIGITAL programme, alongside RCEP implementation. These strategically important provinces constitute the core of the Western Land-Sea New Corridor and represent China's primary gateway to ASEAN, with strengthening Malaysia trade ties. The final unbalanced panel comprises 41 province-year observations: Chongqing and Guangxi each contribute all 11 years, Guizhou contributes nine years because 2013-2014 are missing, and Yunnan contributes ten years because 2023 is missing.

The model includes the core constructs shown in Table 1. This was done while making sure the original theoretical ideas were kept complete. Innovation Input (Ii1-Ii3) is measured by research and development (R&D) expenditure, reflecting regional investment in talent, capital, and equipment (Huang & Zhou, 2025; Kharenko & Skrypnyk, 2025). Innovative Achievement Transformation (IAT1-IAT4) captures the conversion of innovations into commercial outputs, measured through technology contract values (Hong et al., 2016; Liu & Xia, 2018). Digital Industrialisation (DI1, DI2) is measured by software and IT service revenue as a share of GDP, serving as an objective indicator of digital industry scale (Dabbous et al., 2023; Xu et al., 2024). Industrial Digitalisation (ID1-ID4) is measured by e-commerce activity, online sales and purchase ratios, and computer usage, indicating the degree to which digital technologies transform traditional industries (Li, 2024; Ouyang et al., 2024). Government Digital Attention (GFA1, GFA2) measures digital economy keyword frequency in policy texts, indicating governmental prioritisation of the digital economy (Wang & Sawur, 2022; W. Yang et al., 2024). China-Malaysia Foreign Trade (C-MFT1, C-MFT2) comprises export and import values, capturing the specific trade corridor effect (Gan et al., 2023; Wan et al., 2023).

Table 1
Research constructs and measurement indicators

Constructs	Items	Indicators
Innovation investment	Ii1	Basic research as a percentage of GDP in research and experimental development expenditures
	Ii2	Applied research as a percentage of GDP in research and experimental development expenditures
	Ii3	Experimental development as a percentage of GDP in research and experimental development expenditures
Innovative Achievements Transformation	IAT1	Technology development as a percentage of scientific and technological activities (10,000 yuan)
	IAT2	Technology transfer as a percentage of scientific and technological activities (10,000 yuan)
	IAT3	Technology consulting as a percentage of scientific and technological activities (10,000 yuan)
	IAT4	Technology services as a percentage of scientific and technological activities (10,000 yuan)

Constructs	Items	Indicators
Digital Industrialisation	DI1	Software business revenue as a percentage of GDP
	DI2	Information technology service revenue as a percentage of GDP
Industrial Digitalisation	ID1	Number of enterprises engaging in e-commerce transactions (%)
	ID2	E-commerce sales as a percentage of GDP
	ID3	E-commerce purchases as a percentage of GDP
	ID4	Number of computers used per 100 people (units)
China-Malaysia Foreign Trade	C-MFT1	Malaysia's exports (10,000 yuan)
	C-MFT2	Malaysia's imports (10,000 yuan)
Government Digital Attention	GFA1	Digital economy policy word frequency sum - A
	GFA2	Digital economy policy word frequency sum - B

Structural Model and Methodology

This study uses Partial Least Squares Structural Equation Modelling (PLS-SEM) via SmartPLS 4, selected because it accommodates latent variables, moderated mediation, and predictive exploratory research (Hair & Alamer, 2022; Haji-Othman & Yusuff, 2022; Haji-Othman et al., 2024). The maximum number of structural predictors pointing to any endogenous construct is two: Digital Industrialisation and Industrial Digitalisation jointly predict China-Malaysia Foreign Trade, while Innovative Achievement Transformation and its interaction with Government Digital Attention jointly predict each digitalisation construct. Accordingly, the 10-times rule gives a minimum of 20 observations, and the available sample (N = 41) exceeds this threshold (Barclay et al., 1995). The measurement model is first evaluated for reliability and validity: Cronbach's alpha and composite reliability must exceed 0.7, average variance extracted (AVE) must surpass 0.5, and outer loadings must be above 0.4 (Dzin & Lay, 2021; Li & Lay, 2024). Discriminant validity is confirmed when heterotrait-monotrait (HTMT) ratios remain below 0.90 (Hair et al., 2019; Haverila et al., 2025). Subsequently, bias-corrected bootstrap resampling with 10,000 iterations produces t-values and confidence intervals for path coefficients, with significance established when intervals exclude zero (Staines et al., 2019; Fang et al., 2022). Model fit is assessed through R-squared, while predictive relevance is verified via Q-squared values exceeding zero (Fang et al., 2022).

Analysis of Empirical Results

Descriptive Statistics

Table 2 summarises the descriptive statistics for all variables. Overall, these variables cover innovation investment, innovation achievement transformation, digital industrialisation, industrial digitisation, government digital attention and related economic indicators. Their range and degree of variation reflect the diversity of the research sample.

Table 2
Descriptive statistics of main variables

	Mean	Median	Min	Max	S.D.	Obs.
C-MFT1	461929.974	444738.720	24577.024	1269598.458	340598.771	41
C-MFT2	618332.427	287900.000	7970.760	2411471.057	755180.540	41
DI1	0.028	0.013	0.003	0.105	0.029	41
DI2	0.019	0.009	0.000	0.069	0.019	41
GFA1	30.951	31.000	4.000	75.000	17.173	41
GFA2	21.634	17.000	0.000	55.000	15.506	41
IAT1	762150.771	622033.440	135169.970	2603011.640	530632.721	41
IAT2	283849.207	75261.000	8709.000	2693484.960	500365.165	41
IAT3	116770.875	98367.000	13263.820	537467.430	102910.433	41
IAT4	2525032.940	1473491.650	296001.340	9261213.900	2058758.643	41
ID1	9.966	10.400	3.100	17.200	2.836	41
ID2	0.133	0.097	0.044	0.488	0.084	41
ID3	0.054	0.046	0.016	0.163	0.029	41
ID4	26.415	27.000	17.000	36.000	5.499	41
Ii1	0.001	0.001	0.000	0.001	0.000	41
Ii2	0.001	0.001	0.001	0.003	0.001	41
Ii3	0.009	0.007	0.005	0.021	0.005	41

Measurement model evaluation

Table 3 shows the results for the measurement model. The Cronbach's alpha values for all constructs are greater than 0.7. This points to strong internal consistency. The CR values, which span from 0.809 to 0.989, also all meet the 0.7 standard, further verifying reliability. The loadings of all measurement indicators are greater than 0.4. The AVE value for every construct is at least 0.5. Overall, the pattern of outer loadings and AVE values indicates that the measurement model has good convergent validity.

Table 3
Measurement model reliability and convergent validity evaluation results

Constructs	Type	Items	Outer loadings	Cronbach's α	CR	AVE
Innovation investment	Reflective	Ii1	0.687	0.843	0.907	0.769
		Ii2	0.974			
		Ii3	0.942			
Innovative Achievements Transformation	Reflective	IAT1	0.755	0.708	0.809	0.520
		IAT2	0.540			
		IAT3	0.765			
		IAT4	0.794			
Digital Industrialisation	Reflective	DI1	0.990	0.978	0.989	0.978
		DI2	0.989			
Industrial Digitalisation	Reflective	ID1	0.848	0.811	0.877	0.647
		ID2	0.818			
		ID3	0.930			
		ID4	0.579			
China-Malaysia Foreign Trade	Reflective	C-MFT1	0.823	0.752	0.882	0.789
		C-MFT2	0.949			
Government Digital Attention	Reflective	GFA1	0.973	0.947	0.974	0.949
		GFA2	0.975			

The HTMT ratios between constructs are presented in Table 4. All values remain well under the strict cut-off of 0.90. The measurement model demonstrates acceptable discriminant validity as a whole.

Table 4
HTMT Discriminant Validity Test Table

	China-Malaysia Foreign Trade	Digital Industrialisation	Government Digital Attention	Industrial Digitalisation	Innovation Achievement Transformation	Innovation investment
China-Malaysia Foreign Trade						
Digital Industrialisation	0.783					
Government Digital Attention	0.140	0.574				
Industrial Digitalisation	0.446	0.785	0.845			
Innovation Achievement Transformation	0.505	0.587	0.411	0.796		
Innovation investment	0.646	0.883	0.657	0.889	0.427	

As shown in Table 5, the model shows strong explanatory power for its main variable.

Table 5
Model explanatory power and prediction correlation test

	R-square	Q-square
China-Malaysia Foreign Trade	0.679	0.476
Digital Industrialisation	0.609	0.530
Industrial Digitalisation	0.738	0.445
Innovation Achievement Transformation	0.187	0.038

Structural Model and Hypothesis Testing

Table 6 reports the direct effects. H1 is supported: innovation investment significantly promotes innovation achievement transformation ($\beta = 0.433$, $p < 0.01$). H2a and H2b are supported: innovation achievement transformation (IAT) positively drives both digital industrialisation ($\beta = 0.474$, $p < 0.01$) and industrial digitalisation ($\beta = 0.389$, $p < 0.01$). H3a and H3b are supported: government digital attention significantly and positively moderates both relationships ($\beta = 0.439$, $p < 0.01$; $\beta = 0.318$, $p < 0.05$), indicating institutional synergies.

The core digital paradox is confirmed. H4a is strongly supported: digital industrialisation exerts a large positive effect on trade ($\beta = 1.183$, $p < 0.01$). Critically, H4b is rejected: industrial digitalisation significantly suppresses China-Malaysia Foreign Trade ($\beta = –0.632$, $p < 0.01$).

Table 6
Direct Effects and Hypothesis Testing

Path	β	T-statistic	p-value	Decision
Innovation Investment → Innovation Achievement Transformation	0.433	2.876	0.004	H1: Supported
Innovation Achievement Transformation → Digital Industrialisation	0.474	3.821	0.000	H2a: Supported
Innovation Achievement Transformation → Industrial Digitalisation	0.389	3.959	0.000	H2b: Supported
Gov. Digital Attention × IAT → Digital Industrialisation	0.439	3.071	0.002	H3a: Supported
Gov. Digital Attention × IAT → Industrial Digitalisation	0.318	2.332	0.020	H3b: Supported
Digital Industrialisation → China-Malaysia Foreign Trade	1.183	8.419	0.000	H4a: Supported
Industrial Digitalisation → China-Malaysia Foreign Trade	–0.632	3.648	0.000	H4b: Rejected

Mediation analysis (Table 7) reveals divergent transmission mechanisms. H5a is supported: a positive mediating effect operates through digital industrialisation (indirect effect = +0.561, $p < 0.01$), mapping an "innovation → new industries → trade promotion" pathway. H5b is rejected: a significant negative mediating effect operates through industrial digitalisation (indirect effect = –0.246, $p < 0.01$), revealing a supplementary "innovation → old industry reform → trade reduction" trajectory.

Table 7
Mediation Effect Results

Path	Indirect Effect	T-statistic	p-value	Decision
IAT → Digital Industrialisation → China-Malaysia Trade	0.561	3.718	0.000	H5a: Supported
IAT → Industrial Digitalisation → China-Malaysia Trade	–0.246	2.943	0.003	H5b: Rejected
Gov. Digital Attention → Digital Industrialisation → China-Malaysia Foreign Trade	0.513	2.643	0.008	-
Gov. Digital Attention → Industrial Digitalisation → China-Malaysia Foreign Trade	-0.405	3.167	0.002	-

Government digital attention exerts a dual moderating effect on trade. Its indirect effect via digital industrialisation is positive (+0.513, $p < 0.01$), but its indirect effect via industrial digitalisation is negative (–0.405, $p < 0.01$). The interaction term "Government Digital Attention × Innovation Achievement Transformation" shows a significant positive total effect

on trade (β = 0.318, p = 0.013), indicating that the positive digital-industrialisation pathway outweighs the negative industrial-digitalisation pathway when institutional coordination is present.

Discussion

The empirical confirmation of the digital paradox (H4b and H5b rejected) reflects a fundamental restructuring of regional competitiveness. Industrial digitalisation in western China initially enhances manufacturing efficiency through industrial internet and big-data applications (Zhang et al., 2021; Pan et al., 2022; Ma et al., 2023; Hong et al., 2025; Tian & He, 2025). However, rather than generating export advantages, this efficiency gain produces import substitution. Digitally upgraded local firms source intermediate inputs domestically rather than from Malaysia, transforming the bilateral relationship from vertical complementarity to horizontal competition (Wenpu, 2021; Zhang et al., 2021; L. Yang et al., 2024; Hong et al., 2025). The substantial negative path coefficient (β = –0.632) indicates that when import-substitution effects dominate export-creation effects, bilateral trade contracts.

The second deep reason for the "digital paradox" is that institutions are not working together as quickly as they should. This makes a invisible barrier that stops the trade benefits of digitalising industry. It is true that "Government Digital Attention" helps industrial digitalisation (H3b). But the efficiency gains are not being disseminated. Institutional friction is what is causing the problem. RCEP has made trade easier on a large scale, but there are still problems on a small scale. These encompass regulations pertaining to data flows, digital identities, and electronic invoices (Autio et al., 2021; Deng et al., 2024; Yu & Yao, 2024; Guo & Li, 2025; H. Zhang et al., 2025; Jiang, 2025). Digitalisation companies have to deal with high costs and a lot of uncertainty when they go global because of this. This means that digital technology can not make regional supply chains better as much as it could. The productivity gains are ultimately confined within the nation. This makes efficiency flow through the country, but it does not lead to real growth in trade between regions.

This research presents a more intricate and profound understanding of the role of government intervention. The overall impact of "Government Digital Attention" on trade is negligible. However, its interaction with innovation translation yields a significant positive total effect (β=0.318, p=0.013). This tells us how to fix the digital paradox. The way the government gets involved needs to change. It needs to go from giving one person power to giving everyone power. Because of this, local governments in western China have two jobs. The first is to be a precise facilitator. They should give more strategic advice instead of just broad policies. Instead of competing with ASEAN markets, the government should find and support digital industries that work well with them. It should direct resources to "Digital Industrialisation" sectors that generate new commerce. This helps keep the digital paradox from happening in the first place (Chen et al., 2023; Jin & Pan, 2023; Wang & Wei, 2023). The second job is to be the coordinator for the institution. The biggest problem is that the institutions do not work well together. The government needs to change from being an internal manager to an external coordinator. It should start talking about digital rules on platforms that connect China and ASEAN. It might want to set up a Western China-ASEAN Digital Trade Pilot Zone. It can try out new rules for things like e-signatures and data flows in this area. This new way of doing things in institutions can break down the invisible barriers. It

will turn the efficiency gains from industrial digitalisation into a real engine for trade growth in the region (Foster & Azmeh, 2019; Chen et al., 2023; Lei et al., 2024).

Conclusion

This study empirically examines the inhibitory impact of industrial digitalisation on China-Malaysia trade. It shows that the digital paradox is real. The restructuring of regional competitiveness and a delay in institutional coordination are what caused this paradox. The results are a significant reminder for those who make policy. The digital economy does not always have a good effect on trade. We need to be careful about structural friction in the regions. Western China should make its digital trade strategy more forward-looking and different in the future. On one hand, it should help the Malaysian economy by guiding its industry digitalisation progress. On the other hand, it must strongly push for the export of high-quality digital goods and services that come from digital industrialisation. It should also help build the digital governance system between China and ASEAN. The final goal is to change the "digital paradox" into a new situation of "digital win-win".

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References

Abbasi, H., & Haryana., A. U. (2017). PORTER'S INDUSTRY ANALYSIS AND VALUE CHAIN MODEL. International Journal of Advanced Research, 5(5), 990-1003. https://doi.org/10.21474/ijar01/4208

Arwani, A., & Priyadi, U. (2024). The Role and Contribution of The New Institutional Economics In Economic System Performance. Jurnal Simki Economic, 7(1), 271-288. https://doi.org/10.29407/jse.v7i1.508

Autio, E., Mudambi, R., & Yoo, Y. (2021). Digitalisation and globalization in a turbulent world: Centrifugal and centripetal forces. Global Strategy Journal, 11(1), 3-16. https://doi.org/10.1002/gsj.1396

Banerjee, S., Bose, P., & Siddiqui, I. N. (2022). Digital Dynamics and International Trade. International Journal of Asian Business and Information Management, 13(1), 1-16. https://doi.org/10.4018/ijabim.297849

Barclay, D., Higgins, C., & Thompson, R. (1995). The Partial Least Squares (PLS) approach to causal modeling: Personal computer adoption and use as an illustration. Technology Studies, 2(2), 285–309. https://www.researchgate.net/publication/242663837_The_Partial_Least_Squares_PLS_Approach_to_Causal_Modeling_Personal_Computer_Use_as_an_Illustration/citations#full-text

Calderon-Monge, E., & Ribeiro-Soriano, D. (2023). The role of Digitalisation in business and management: a systematic literature review. Review of Managerial Science, 18(2), 449-491. https://doi.org/10.1007/s11846-023-00647-8

Chen, W., Du, X., Lan, W., Wu, W., & Zhao, M. (2023). HOW CAN DIGITAL ECONOMY DEVELOPMENT EMPOWER HIGH-QUALITY ECONOMIC DEVELOPMENT? Technological and Economic Development of Economy, 29(4), 1168-1194. https://doi.org/10.3846/tede.2023.18784

Chen, Y., & Gao, Y. (2022). Comparative analysis of digital trade development strategies and governance approaches. Journal of Digital Economy, 1(3), 227-238. https://doi.org/10.1016/j.jdec.2023.02.001

Chin, Y., & Zhao, J. (2022). Governing Cross-Border Data Flows: International Trade Agreements and Their Limits. Laws, 11(4), 63. https://doi.org/10.3390/laws11040063

Dabbous, A., Barakat, K. A., & Kraus, S. (2023). The impact of Digitalisation on entrepreneurial activity and sustainable competitiveness: A panel data analysis. Technology in Society, 73, 102224. https://doi.org/10.1016/j.techsoc.2023.102224

Deng, X., Zhang, F., Lin, S., & Qiu, W. (2024). Research on the Structural Characteristics and Influencing Factors of Digital Service Trade Networks in RCEP Member States. Sustainability, 16(23), 10567. https://doi.org/10.3390/su162310567

Dzin, N. H. M., & Lay, Y. F. (2021). Validity and Reliability of Adapted Self-Efficacy Scales in Malaysian Context Using PLS-SEM Approach. Education Sciences, 11(11), 676. https://doi.org/10.3390/educsci11110676

Fang, J., Wen, Z., OuyangG, J., & Cai, B. (2022). Methodological research on moderation effects in China's mainland. Advances in Psychological Science, 30(8), 1703-1714. https://doi.org/10.3724/sp.j.1042.2022.01703

Foster, C., & Azmeh, S. (2019). Latecomer Economies and National Digital Policy: An Industrial Policy Perspective. The Journal of Development Studies, 56(7), 1247-1262. https://doi.org/10.1080/00220388.2019.1677886

Gan, T., Zhang, M., & Zhang, Z. (2023). The impact of digital government policy on entrepreneurial activity in China. Economic Analysis and Policy, 79, 479-496. https://doi.org/10.1016/j.eap.2023.06.029

Guo, S., & Li, X. (2025). Cross-border data flow in China: Shifting from restriction to relaxation? Computer Law & Security Review, 56, 106079. https://doi.org/10.1016/j.clsr.2024.106079

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. European Business Review, 31(1), 2-24. https://doi.org/10.1108/ebr-11-2018-0203

Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. Research Methods in Applied Linguistics, 1(3), 100027. https://doi.org/10.1016/j.rmal.2022.100027

Haji-Othman, Y., Yusuff, M. S. S., & Hussain, M. N. M. (2024). Data Analysis Using Partial Least Squares Structural Equation Modeling (PLS-SEM) in Conducting Quantitative Research. International Journal of Academic Research in Business and Social Sciences, 14(10), 2380-2388. https://doi.org/10.6007/ijarbss/v14-i10/23364

Haji-Othman, Y., & Yusuff, M. S. S. (2022). Assessing Reliability and Validity of Attitude Construct Using Partial Least Squares Structural Equation Modeling (PLS-SEM). International Journal of Academic Research in Business and Social Sciences, 12(5), 378-385. https://doi.org/10.6007/ijarbss/v12-i5/13289

Haverila, M., Twyford, J. C., & Zarea, H. (2025). Analyzing the Interaction of Industry 4.0 and Sustainable Global Marketing Channel Development with Necessary Condition Analysis: The Role of Inter-Organizational Trust. Sustainability, 17(6), 2489. https://doi.org/10.3390/su17062489

Hong, J., Feng, B., Wu, Y., & Wang, L. (2016). Do government grants promote innovation efficiency in China's high-tech industries? Technovation, 57-58, 4-13. https://doi.org/10.1016/j.technovation.2016.06.001

Hong, Y., Wang, N., & Chen, L. (2025). Research on the influence and mechanism of digital industry agglomeration on regional quality competitiveness. Journal of Competitiveness, 17(1), 55-77. https://doi.org/10.7441/joc.2025.01.04

Huang, W., & Zhou, X. (2025). The Construction of New Land and Sea Corridors in the West from the Perspective of "Soft Connectivity". Improvement of the Path. Journal of Education and Educational Research, 12(3), 68-72. https://doi.org/10.7441/joc.2025.01.04

Javaid, M., Haleem, A., Singh, R. P., & Sinha, A. K. (2024). Digital economy to improve the culture of industry 4.0: A study on features, implementation and challenges. Green Technologies and Sustainability, 2(2), 100083. https://doi.org/10.1016/j.grets.2024.100083

Jiang, K., & Ye, X. (2017). Resource and Environment Performance Assessment for Prefecture-Level National Sustainable Communities. Sustainable Development, 7(2), 102-109. https://doi.org/10.3390/w14172672

Jiang, S. (2025). Fragmented Rules, Global Flows: How Legal Differences Shape the Cross-Border Data Landscape-Evidence from the EU, US, and China. Lecture Notes in Education Psychology and Public Media, 96(1), 47-57. https://doi.org/10.54254/2753-7048/2025.bo23772

Jin, X., & Pan, X. (2023). Government Attention, Market Competition and Firm Digital Transformation. Sustainability, 15(11), 9057. https://doi.org/10.3390/su15119057

Kharenko, V., & Skrypnyk, N. (2025). Transformation of international trade in the context of increasing global competition. Galician Economic Journal, 93(2), 172-182. https://doi.org/10.33108/galicianvisnyk_tntu2025.02.172

Lei, H., Tang, C., & Long, Y. (2024). Study on the impact of digital economy on industrial collaborative agglomeration: Evidence from manufacturing and productive service industries. Plos One, 19(8), e308361. https://doi.org/10.1371/journal.pone.0308361

Li, M., Zhang, L., & Zhang, Z. (2023). Impact of Digital Economy on Inter-Regional Trade: An Empirical Analysis in China. Sustainability, 15(15), 12086. https://doi.org/10.3390/su151512086

Li, Q., & Zhao, S. (2023). The Impact of Digital Economy Development on Industrial Restructuring: Evidence from China. Sustainability, 15(14), 10847. https://doi.org/10.3390/su151410847

Li, W., & Lay, Y. F. (2024). Examining the Reliability and Validity of Measuring Scales related to Informatization Instructional Leadership Using PLS-SEM Approach. Dinamika Jurnal Ilmiah Pendidikan Dasar, 16(1), 12-32. https://doi.org/10.30595/dinamika.v16i1.19768

Li, Y. (2024). How the Chinese Government Guides Data Governance to Support Digital Economy Development. Frontiers in Business, Economics and Management, 15(3), 414-417. https://doi.org/10.54097/gj94g791

Liang, S., & Tan, Q. (2024). Can the digital economy accelerates China's export technology upgrading? Based on the perspective of export technology complexity. Technological Forecasting and Social Change, 199, 123052. https://doi.org/10.1016/j.techfore.2023.123052

Liu, C., & Xia, G. (2018). Research on the Dynamic Interrelationship among R&D Investment, Technological Innovation, and Economic Growth in China. Sustainability, 10(11), 4260. https://doi.org/10.3390/su10114260

Luo, R., & Zhou, N. (2022). Dynamic Evolution, Spatial Differences, and Driving Factors of China's Provincial Digital Economy. Sustainability, 14(15), 9376. https://doi.org/10.3390/su14159376

Ma, H., Jin, B., Luo, T., Ding, L., & Song, B. (2023). Development Path of Digital Agriculture in Southwest Mountainous Areas of China in the Context of Chinese Path to Modernization. Chinese Journal of Engineering Science, 25(4), 50-58. https://doi.org/10.15302/j-sscae-2023.07.011

Ma, H., & Kang, C. (2025). Research on the Impact of the Development of China's Digital Trade on the International Competitiveness of the Manufacturing Industry. Systems, 13(4), 283. https://doi.org/10.3390/systems13040283

Ma, M., Yu, Z., Ma, L., & Guo, W. (2025). Institutional openness and city cross-border e-commerce: Evidence from China's pilot free trade zones. Economic Analysis and Policy, 85, 558-570. https://doi.org/10.1016/j.eap.2024.12.026

Ma, X., Feng, X., Fu, D., Tong, J., & Ji, M. (2024). How does the digital economy impact sustainable development? —An empirical study from China. Journal of Cleaner Production, 434, 140079. https://doi.org/10.1016/j.jclepro.2023.140079

Malaysia External Trade Development Corporation. (2024). Trade performance for year 2024 and December 2024. https://www.matrade.gov.my/en/about-matrade/media/press-releases/6264-trade-performance-for-year-2024-and-december-2024

Matt, D. T., Pedrini, G., Bonfanti, A., & Orzes, G. (2023). Industrial Digitalisation. A systematic literature review and research agenda. European Management Journal, 41(1), 47-78. https://doi.org/10.1016/j.emj.2022.01.001

Meltzer, J. P. (2019). Governing Digital Trade. World Trade Review, 18(S1), S23-S48. https://doi.org/10.1017/s1474745618000502

Mercuro, N., & Medema, S. G. (2020). The New Institutional Economics. In Economics and the Law: From Posner to Postmodernism and Beyond - Second Edition. Princeton University Press. https://doi.org/10.1515/9780691216010

Mirakhor, A., & Askari, H. (2017). Institutional Structure of a Sound Economy. In Ideal Islamic Economy. Palgrave Macmillan, New York. https://doi.org/10.1057/978-1-137-53727-0_4

Mishra, N., & Valencia, A. M. P. (2023). Digital services and digital trade in the Asia pacific: an alternative model for digital integration? Asia Pacific Law Review, 31(2), 489-513. https://doi.org/10.1080/10192557.2023.2216058

Natanael, Y. (2025). Beyond borders and tangibility: understanding trade restrictions, institutional quality and digital services trade. International Journal of Development Issues, 24(3), 396-415. https://doi.org/10.1108/ijdi-11-2024-0294

Ouyang, R., Jing, W., Liu, Z., & Tang, A. (2024). Development of China's digital economy: path, advantages and problems. Journal of Internet and Digital Economics, 4(3), 141-160. https://doi.org/10.1108/jide-05-2024-0022

Pan, W., Xie, T., Wang, Z., & Ma, L. (2022). Digital economy: An innovation driver for total factor productivity. Journal of Business Research, 139, 303-311. https://doi.org/10.1016/j.jbusres.2021.09.061

Parida, V., Din, D. S., & Reim, W. (2019). Reviewing Literature on Digitalisation, Business Model Innovation, and Sustainable Industry: Past Achievements and Future Promises. Sustainability, 11(2), 391. https://doi.org/10.3390/su11020391

Porter, M. (1990). Competitive Advantage of Nations. Competitive Intelligence Review, 1(1), 14. https://doi.org/10.1002/cir.3880010112

Reátegui, R. M. (2013). An Introduction to Institutional Coordination as An Alternate Model for Neo-Institutional Economic Analysis. Revista Procesos De Mercado, 10(2), 151-197. https://doi.org/10.52195/pm.v10i2.194

Shang, Y., Lee, H., & Ma, J. (2025). A Study on the Spatial Effects of the Digital Economy on Regional Economic Growth in China. Sustainability, 17(5), 2259. https://doi.org/10.3390/su17052259

Staines, A., Gauttier, S., Connolly, R., Davis, P., Connolly, J., Weston, D., & Boilson, A. (2019). Visualising Q-from the bootstrap to interactive graphics. European Journal of Public Health, 29(Supplement_4), ckz187-ckz198. https://doi.org/10.1093/eurpub/ckz187.098

Su, L. (2024). Research on the Current Situation and Problems of Digital Economy Trade between China and ASEAN Countries. Open Journal of Business and Management, 12(1), 148-157. https://doi.org/10.4236/ojbm.2024.121010

Tian, S., & He, Y. (2025). The impact of digital industry development on regional economic resilience: Evidence from China. Plos One, 20(2), e315203. https://doi.org/10.1371/journal.pone.0315203

TU, Y., HAO, P., & LONG, L. (2023). Job replacement or job transformation? Definition, consequences, and sources of technology-driven job insecurity. Advances in Psychological Science, 31(8), 1359-1373. https://doi.org/10.3724/sp.j.1042.2023.01359

Tukirin, T. (2023). Business Strategy and Competitive Advantage of Companies. Jurnal Ilmiah Manajemen Kesatuan, 11(3), 1495-1504. https://doi.org/10.37641/jimkes.v11i3.2334

Wan, X., Lee, K. Y., & Ho, K. C. (2023). Changes in Trade Structure and Social Relationship between China and Malaysia Under Cross-border E-commerce Culture. International Journal of China Studies, 14(1), 139-169. https://doi.org/10.22452/ijcs.vol14no1.6

Wang, D., Xu, P., An, B., & Song, Y. (2024). How does the development of the digital economy in RCEP member countries affect China's cross-border e-commerce exports? Plos One, 19(12), e310975. https://doi.org/10.1371/journal.pone.0310975

Wang, H., & Sawur, Y. (2022). The Relationships between Government Subsidies, Innovation Input, and Innovation Output: Evidence from the New Generation of Information Technology Industry in China. Sustainability, 14(21), 14043. https://doi.org/10.3390/su142114043

Wang, Q., & Wei, Y. (2023). Research on the Influence of Digital Economy on Technological Innovation: Evidence from Manufacturing Enterprises in China. Sustainability, 15(6), 4995. https://doi.org/10.3390/su15064995

Wang, X., Li, Y., Tian, L., & Hou, Y. (2023). Government digital initiatives and firm digital innovation: Evidence from China. Technovation, 119, 102545. https://doi.org/10.1016/j.technovation.2022.102545

Wen, X. (2025). Research on the Measurement of the Development Level of China's Provincial Digital Economy and Its Temporal and Spatial Differentiation Based on the AHP-Entropy Weight Method. Shs Web of Conferences, 215, 1008. https://doi.org/10.1051/shsconf/202521501008

Wenpu, Y. (2021). Digital Economy and Regional Economic Growth: Advantages or Disadvantages? Journal of Shanghai University of Finance and Economics, 23(3), 19-31. https://doi.org/10.16538/j.cnki.jsufe.2021.03.002

Xinhua. (2025). Malaysia–China industrial cooperation to bring new opportunities. https://english.news.cn/20250422/a13fb8eb6aaa426da4254f13844276b9/c.html

Xu, A., Li, P., & Xin, X. (2024). The Impact of Digital Governance on Entrepreneurial Activity in Relatively Poor Areas: Evidence from Tibet, China. Sustainability, 16(17), 7247. https://doi.org/10.3390/su16177247

Xu, Q. (2023). The mediating effect of digital economy on international trade -- Evidence from China. Shs Web of Conferences, 165, 2014. https://doi.org/10.1051/shsconf/202316502014

Xu, Y., Tao, Y., Zhang, C., Xie, M., Li, W., & Tai, J. (2022). Review of Digital Economy Research in China: A Framework Analysis Based on Bibliometrics. Computational Intelligence and Neuroscience, 2022, 2427034. https://doi.org/10.1155/2022/2427034

Xu, Y., & Xu, L. (2023). The Convergence between Digital Industrialisation and Industrial Digitalisation and Export Technology Complexity: Evidence from China. Sustainability, 15(11), 9081. https://doi.org/10.3390/su15119081

Yang, L., Dong, J., & Yang, W. (2024). Analysis of Regional Competitiveness of China's Cross-Border E-Commerce. Sustainability, 16(3), 1007. https://doi.org/10.3390/su16031007

Yang, W., Wang, X., & Zhou, D. (2024). Research on the Impact of Industrial Policy on the Innovation Behavior of Strategic Emerging Industries. Behavioral Sciences, 14(4), 346. https://doi.org/10.3390/bs14040346

Yao, J., & Wang, S. (2023). A Study on the Integration Path of China-ASEAN Digital RMB Cross-border E-commerce in the Context of Big Data. Journal of Education, Humanities and Social Sciences, 16, 295-301. https://doi.org/10.54097/ehss.v16i.9773

Yu, H., & Yao, L. (2024). The impact of digital trade regulation on the manufacturing position in the GVC. Economic Modelling, 135, 106712. https://doi.org/10.1016/j.econmod.2024.106712

Zhang, H., Kim, H., & Moon, S. (2025). The Effects of Data Restriction Policies and Institutions on Digital Financial Service and Trade. Emerging Markets Finance and Trade, 61(9), 2745-2762. https://doi.org/10.1080/1540496x.2025.2467190

Zhang, J., Lyu, Y., Li, Y., & Geng, Y. (2022). Digital economy: An innovation driving factor for low-carbon development. Environmental Impact Assessment Review, 96, 106821. https://doi.org/10.1016/j.eiar.2022.106821

Zhang, K., Cao, B., Guo, Z., Li, R., & Li, L. (2024). Research on the impact of government attention on the digital economy of Chinese provinces. Innovation and Green Development, 3(2), 100118. https://doi.org/10.1016/j.igd.2023.100118

Zhang, L., Pan, A., Feng, S., & Qin, Y. (2022). Digital economy, technological progress, and city export trade. Plos One, 17(6), e269314. https://doi.org/10.1371/journal.pone.0269314

Zhang, L., Pham, T. D., Li, R., & Do, T. T. (2025). Enhancing the Sustainable Development of the ASEAN's Digital Trade: The Impact Mechanism of Innovation Capability. Sustainability, 17(4), 1766. https://doi.org/10.3390/su17041766

Zhang, W., Zhao, S., Wan, X., & Yao, Y. (2021). Study on the effect of digital economy on high-quality economic development in China. Plos One, 16(9), e257365. https://doi.org/10.1371/journal.pone.0257365

Zheng, Y. (2024). Analysis of Regional Differences in China's Digital Economy Development and Dynamic Evolution. Academic Journal of Business & Management, 6(8), 109-118. https://doi.org/10.25236/ajbm.2024.060817